

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant: Tsujimichi, et al.  
Serial No.: 10/625,272  
Filed: July 23, 2003  
Art Unit: 1793  
Examiner: Edward M. Johnson  
Confirmation No.: 8414  
Title: PHOTOCATALYTIC HYDROPHILIFIABLE MATERIAL

**REPLY BRIEF UNDER 37 CFR 41.41**

Board of Patent Appeals and Interferences  
United States Patent & Trademark Office  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

In connection with the subject application, and further to the Examiner's Answer dated 2 June 2009, please enter this Reply Brief pursuant to 37 CFR 41.41.

## REPLY TO EXAMINER'S RESPONSE PRESENTED IN ANSWER

### Issues Raised in the Answer

1. At page 3 of the Answer, in relation to the rejection of claim 53 under 35 USC 102(e) as allegedly anticipated by Komatsu '708, the Examiner asserts that Komatsu discloses an anti-fog method comprising contacting air with a material comprising a glass substrate and a photocatalyst film (Komatsu abstract and column 2, lines 25-32), "... wherein the film comprises inorganic oxides such as  $Al_2O_3$  and  $SiO_2$  and has a hydrophilic property (see column 2, lines 33-35) and  $TiO_2$  ..." and "The components are all in close proximity in a layer over the substrate as claimed with no intervening layers or components."

### Appellant's Response

Upon careful consideration of the Examiner's response, appellant respectfully maintains that the Examiner's position is not supported by Komatsu's disclosure, but rather is contradicted thereby, and other wise does not accurately reflect the language of claim 53.

It is indisputable that Komatsu's anti-fog element includes two separate and distinct films / layers, i.e., a first film / layer 18 which comprises a photocatalytic compound such as  $TiO_2$  provided over the surface of a substrate, and a second film and a second film / layer 12 of a transparent inorganic oxide such as  $SiO_2$  or  $Al_2O_3$  provided over the first film. The separate distinct nature of the two films 12, 18 is an important aspect of Komatsu's disclosed and patented invention, e.g., Komatsu expressly discusses that the transparent porous inorganic oxide film 12 is formed to cover over the film 18 of the photocatalyzer and has a surface exhibiting a hydrophilic property so that organic matters, etc. deposited in openings of the porous inorganic oxide film are dissolved and removed by a photocatalytic reaction caused by light excitation of the photocatalyzer

film 18 whereby the anti-fog property of the anti-fog element can be maintained over a long period of time. (Komatsu abstract).

Given such indisputable disclosure, the Examiner's statement that Komatsu's photocatalyst film "... comprises inorganic oxides such as  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$  and has a hydrophilic property" is not correct. The photocatalyst film 18 does not comprise any inorganic oxides such as  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$  because these are in the separate / distinct covering layer 12. Also, the photocatalyst film 18 does not have a hydrophilic property, as asserted, but rather the separate / distinct covering layer 12 has the hydrophilic property according to Komatsu.

Similarly, the Examiner's statement that "The components are all in close proximity in a layer over the substrate as claimed with no intervening layers or components" is not correct because these components are (again) provided in two distinct films/layers. Moreover, while the photocatalyst and inorganic oxide may be in close proximity at the interface between the two films/layers 12, 18, any such interface is not layer, let alone a "surface layer (emphasis added)" as required by claim 53.

The Examiner's assertions view the separate and distinct films 12, 18 as a single layer, but this is not a reasonable position / interpretation. It is not reasonable in view of the plain meaning of "single layer". It is not reasonable given Komatsu's actual disclosure which requires the two separate and distinct films 12, 18 as discussed above. It is not reasonable in view of the present disclosure which shows and emphasizes the significance of providing the photocatalytic material together with the two metal oxides in a single layer created using a single formulation / mixture of these distinct materials. Again, as explained at ¶¶ [0134]-[151] in conjunction with Figs. 1-7 and example 5 of Table 1 of the publication of the present application, the disposition of a metal oxide component (ii) such as  $\text{Al}_2\text{O}_3$  closely together with the photocatalyst such as  $\text{TiO}_2$  in the surface layer permits the photocatalyst to achieve a significantly

enhanced effectiveness in removing contaminants such as  $\text{NO}_x$ ,  $\text{SO}_2$ , and  $\text{CO}_2$  from the air as compared to a surface layer not containing a metal oxide such as component (ii) disposed closely together with the photocatalyst; while as explained at ¶¶ [0221], and [0247]-[0257] of the published application, in conjunction with Table 5, the further addition of a metal oxide corresponding to the component (iii) closely together with the photocatalyst and the metal oxide component (ii) in the single surface layer significantly improves hydrophilicity of the surface layer and this provides a synergistic advantage as discussed at ¶ [0255] of the published application:

“Possessing both the hydrophilic nature and the decomposition activity has the following advantages. Specifically, a two-stage process of removal of stains based on the hydrophilic nature and removal of stains based on the decomposition activity can provide markedly improved removal of deposited stains and improved removing speed. In this case, for some stains, the deposition strength of slight stains left after the removal of stains based on the hydrophilic nature is high. However, the improved decomposition activity through the regulation of the amount of the metal supported enables even the slight stains having high deposition strength to be removed. Further, removal of the stain can prevent the photocatalyst from undergoing light shielding. This can increase the quantity of light applied. Therefore, removal of stains based on the hydrophilic nature and removal of stains based on the decomposition activity can be very efficiently retained.”

2. At page 4 of the Answer, in relation to the rejection of claims 54, 59, and 67 under 35 USC 102(e) as allegedly anticipated by Komatsu '708 the Examiner asserts that “Komatsu '708 discloses the same thickness amount of titanium oxide and inorganic oxide (see column 4, lines 50-55), which would result in a  $a/(a+b)$  value of 0.5.

#### Appellant's Response

Upon careful consideration of the Examiner's response, appellant respectfully submits that the referenced disclosure of Komatsu '708 does not satisfy the claim requirements. The equation in claim 54 pertains to weight percentages of the components (i) and (ii) in a formulation / mixture

used to create the single surface layer, see paragraph [0029] of the published application, whereas the referenced discussion in Komatsu pertains to thicknesses of the two separate film layers 12, 18. Similarly the equation in claim 59 pertains to weight percentages of the photocatalytic component (i) and an additional antimicrobial metal component (iv) *further provided in the single surface layer* for enhanced performance, see paragraphs [0031] and [0177] – [180] and Figs. 10-14 of the published application. The claim requirement are not met or made obvious by thicknesses of Komatsu's separate photocatalytic and inorganic oxide layers 18, 12.

On the other hand, claim 67 requires the components (i) – (iii) to be substantially *intimately mixed and dispersed in the single surface layer*, which is not met or made obvious by Komatsu's separate and distinct layers 12, 18 according to any reasonable interpretation.

3. At page 4 of the Answer, in relation to the rejection of claims 56-58 under 35 USC 102(e) as allegedly anticipated by Komatsu '708 the Examiner asserts that Komatsu discloses ZnO and ZnS (see column 2, lines 40-41), silver and copper (Example 2), Cr and Al (see Examples).

#### Appellant's Response

Upon careful consideration of the Examiner's response, appellant respectfully submits that the referenced disclosure of Komatsu '708 does not satisfy the claim requirements. Claims 56-58 require the single surface layer to "further comprise (emphasis added)" specified metals, while the present disclosure explains that the further addition of these metals to the single surface layer (which also contains the photocatalyst (i) and metal oxides (ii, iii)) provides certain advantages, including enhanced antimicrobial and hydrophilicity characteristics. See paragraphs [0031], [0180]-[0190], [0195]-[0197], [0214] of the published application and page 7 of the Appeal Brief. Conversely, the ZnO and ZnS discussed at Komatsu's column 2, lines 40-41 are the photocatalyst used in his layer 18, the Cr and Al mentioned in his Examples are used to form a mirrored surface

36 between on a surface of the substrate separately from the photocatalyst layer 18, and silver and copper are used to form electrodes for a PTC panel heater 42 provides on a surface of the substrate 10 on the opposite side from the photocatalyst layer 18.

4. At pages 4-5 of the Answer, in relation to the rejection of claim 55 under 35 USC 103(a) as allegedly obvious over Komatsu '708 the Examiner asserts that it would have been obvious to use particles having a diameter of 0.005 to 0.5 microns in the photocatalyst of Komatsu based on the fact that Komatsu's photocatalyst film layer 18 is about 1000 Angstroms.

Appellant's Response

Upon careful consideration of the Examiner's response, appellant respectfully submits that the referenced disclosure of Komatsu '708 does not satisfy or make obvious the claim requirements. Claim 55 requires *both the photocatalyst particles (i) and the metal oxide particles (ii) in the single surface layer to have the diameter*. Moreover, the claimed feature provides an important advantage which is not achieved by or obvious in view of Komatsu. It is explained in the present specification that when the particle diameter of the photocatalyst and the particle diameter of the other compound (amphoteric metal oxide, basic metal oxide, or acidic metal oxide) are in the range of from about 0.005 to 0.5 microns, the regulation of the particle diameter can be advantageously carried out by means of an existing grinding device, such as a ball mill, or by the sol-gel process. Further, according to the fifth preferred embodiment, since there is no significant difference in particle diameter between the photocatalyst and the other compound, particles of the photocatalyst and particles of the other compound having diameters similar to those of the particles of the photocatalyst approach each other, the other reactant or intermediate chemically bonded to the other compound can approach the photocatalyst. This advantageously ensures the opportunity for the catalytic reaction to proceed, realizing improved efficiency. See ¶ [0022].

5. At page 5 of the Answer, in relation to the rejection of claims 61-64 under 35 USC 103(a) as allegedly obvious over Komatsu '708 the Examiner asserts that Komatsu discloses a film of SiO<sub>2</sub> which it applicant's preferred binder, and it would have been obvious to an ordinary artisan to make a glaze or paint on a tile to make the film to be exposed to light.

Appellant's Response

Upon careful consideration of the Examiner's response, appellant respectfully submits that the referenced disclosure of Komatsu '708 does not satisfy or make obvious the claim requirements. The binder layer required by claim 61 is *interposed between* the substrate and the single surface layer (where it would be shielded from exterior light by the surface layer). Conversely, the SiO<sub>2</sub> layer of Komatsu is the inorganic oxide layer 12 provided over the photocatalytic layer 18, directly contrary to the claimed binder layer *interposed between* the substrate and the single surface layer.

6. At pages 5-7 of the Answer, the Examiner provides a Response to Argument in which the Examiner provides various rebuttal comments to appellants' arguments set forth in the Brief, including the following:

- Appellant's argument that Komatsu does not disclose a single surface layer is not persuasive because Appellant's specification (the support for the claimed invention) also describes discrete layers and sols at pages 25-26, while appellant admits that each of Komatsu's film layers 12, 18 are provided on the surface of the other, which would comprise a single layer since there is no intervening layers and at least some contact / combination of the two would occur.
- Appellant's argument that Komatsu teaches away from the claimed invention because he requires two separate and distinct film layers 12, 18 is not persuasive because Komatsu nowhere teaches that Applicant's invention should be avoided.

- Appellant's argument that Komatsu does not teach a mixture of his organic oxides, but instead teaches use of the different inorganic oxides in the alternative is not persuasive because appellant appears to admit that the present applicant describes "discrete layers and sols" as alleged by the Examiner.
- Appellant's argument that the *In re Fitzgerald* case is not applicable to the present situation because there are indisputable differences between the claimed invention involving three components (i) – (iii) substantially intimately mixed and dispersed in a single surface layer is not persuasive because the present invention and the method of Komatsu are not indisputably different because at least some contact / combination would occur in both methods, and because appellant appears to admit that the present applicant describes "discrete layers and sols" as alleged by the Examiner.

#### Appellant's Response

Upon careful consideration of the Examiner's rebuttal comments, appellant respectfully maintains that the Examiner's position is not supported by plain meaning of the claim terms, by Komatsu's disclosure, or by any evidence of record, and is contradicted by the full disclosure of the present specification which explains why the claimed invention involving use of a single surface layer achieves significant, non-obvious advantages over conventional methods / apparatus. Specifically, appellant addresses the Examiner's comments as follows.

- Again, appellant submits that the Examiner's interpretation of Komatsu's separate and distinct film layers 12, 18 as meeting the claimed single surface layer including the three components (i) – (iii) substantially intimately mixed and dispersed therein is not reasonable, as discussed above. Even if some contact would occur at the interface between the two film layers, as the Examiner asserts, this does not make these



- indisputably distinct film layers a single surface layer in which all three components (i) – (iii) are situated in close proximity to one another, and wherein they are substantially intimately mixed and dispersed therein. Moreover, Komatsu never discloses use of a mixture of inorganic oxides in his film layer 12, such that he does not disclose any combination of the three components (i) – (iii) as claimed.
- Relative to the Examiner's assertions that appellant's specification (the support for the claimed invention) describes discrete layers and sols at pages 25-26, and that appellant appears to admit that the present applicant describes "discrete layers and sols" as alleged by the Examiner, appellant respectfully submits that the Examiner's assertions do not accurately reflect the present disclosure or appellant's earlier arguments. While the original specification describes various sols for the components (i) – (iii) at pages 25-26, it is explained that these sols are mixed together to form mixed sols having the formulation involving the ratio  $a/(a+b)$  wherein a is the weight of the metal oxide (components (ii and iii)) and b is the weight of the photocatalyst (component (i)) in the mixed sol. Further, it is discussed that the various mixed sols are applied to respective tiles so as to form a single surface layer on each tile consistent with the requirement of the present claims. Thus the specification does not disclose any "discrete layers" formed using the different sols.
  - On the other hand, at page 15 of the Appeal Brief, appellant does not admit that the specification describes "discrete layers and sols" as alleged by the Examiner. Rather, it was argued that the disclosure at pages 25, 26 does not correspond to a composite structure such as disclosed by Komatsu in which different sols are used to form different layers of the same composite structure, but rather pertains to various "mixed

- sols” which are applied to respective tiles so as to form a single surface layer on each tile consistent with the requirement of the present claims.
- Regarding the Examiner’s response that Komatsu does not teach away from the claimed invention , appellant respectfully traverses the same because it is not a reasonable or accurate application of the law. Based on the fact that Komatsu *requires a multi-layer structure for his anti-fog element*, persons of ordinary skill in the art would recognize that this is a teaching away from the presently claimed invention in which the components (i) – (iii) are disposed in a *single surface layer*. It is not a legal requirement that Komatsu expressly state that his element cannot involve a single layer structure in order to teach away from the claimed invention. Persons skilled in the art would clearly understand that the required multi-layer structure precludes a single layer structure even though Komatsu may not expressly state this.
  - Regarding the Examiner’s response regarding the *In re Fitzgerald* case above, appellant respectfully traverses the same because the Examiner’s position is *not objectively reasonable* given the facts of the present matter, which are not at all like the facts in *In re Fitzgerald*, as previously discussed at pages 15-16 of the Appeal Brief.

#### CONCLUSION

Based on all the foregoing comments, and those presented in appellants’ Appeal Brief, it is respectfully submitted that the Examiner has failed to establish prima facie anticipation of any of claims 53, 54, 56-58, 60 and 66-67 under 35 USC 102(e) in view of the Komatsu patent, and has also failed to establish prima facie obviousness under 35 USC '103(a) of any of claims 55, 59, and 61-65 on appeal in view if the Komatsu patent. Correspondingly, appellant respectfully submits that the Examiner's objections and rejections in the final Office Action are in error, and a reversal of same is respectfully requested.

Favorable consideration and reversal of the final rejection are earnestly solicited.

Respectfully submitted,



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